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Lesson 16: From Ratios to Rates

**Student Outcomes**

* Students associate a description of a ratio relationship, such as “ miles for every hours,” to a new quantity, “ miles/hour,” called a *rate*.
* Given a ratio, students precisely identify the associated rate. They identify the unit rate and the rate unit.

Classwork

Ratios can be transformed to rates and unit rates.

**Example (5 minutes): Introduction to Rates and Unit Rates**

Students complete the problem individually. Encourage students to use prior knowledge of equivalent ratios. Discuss answers and methods after a few minutes of student work time.

Example: Introduction to Rates and Unit Rates

Diet cola was on sale last week; it cost for every packs of diet cola.

* 1. How much do packs of diet cola cost?

|  |  |  |
| --- | --- | --- |
| Packs of Diet Cola |  |  |
| Total Cost |  |  |

 packs of diet cola cost .

* 1. How much does pack of diet cola cost?

|  |  |  |
| --- | --- | --- |
| Packs of Diet Cola |  |  |
| Total Cost |  |  |

 pack of diet cola costs .

After answers have been discussed, use this example to identify the new terms.

**Rate**: Ratio relationship given by “ for every packs of diet cola” can be written as the *rate* “ dollars/pack.”

**Unit Rate**:The *unit rate* is because it is the value of the ratio.

**Rate Unit**: The *rate unit* is dollars/pack of diet cola because it costs dollars for every pack of diet cola.

Now that the new terms have been introduced, use these vocabulary words throughout the lesson.

Exploratory Challenge (25 minutes)

Students may work in pairs or small groups to discuss different methods of solving examples. Encourage them to show or explain their thinking as much as possible. Take note of different ways groups are solving problems. After providing time for groups to solve the problems, have different groups present their findings and explain the methods they used to solve each problem.

Exploratory Challenge

* 1. Teagan went to Gamer Realm to buy new video games. Gamer Realm was having a sale: for video games. He bought games for himself and one game for his friend, Diego, but Teagan does not know how much Diego owes him for the one game. What is the unit price of the video games? What is the rate unit?

The unit price is ; the rate unit is dollars/video game.

*Scaffolding:*

If one of these drivers had been chosen to drive the entire distance,

* Which driver would have gotten them to the game in the shortest time? Approximately how long would this trip have taken?
* Which driver would have gotten them to the game in the greatest amount of time? Approximately how long would this trip have taken?
	1. Four football fans took turns driving the distance from New York to Oklahoma to see a big game. Each driver set the cruise control during his or her portion of the trip, enabling him or her to travel at a constant speed. The group changed drivers each time they stopped for gas and recorded their driving times and distances in the table below.

|  |  |  |
| --- | --- | --- |
| Fan | Distance (miles) | Time (hours) |
| Andre |  |  |
| Matteo |  |  |
| Janaye |  |  |
| Greyson |  |  |

Use the given data to answer the following questions.

* + 1. What two quantities are being compared?

The two quantities being compared are distance and time, which are measured in miles and hours.

* + 1. What is the ratio of the two quantities for Andre’s portion of the trip? What is the associated rate?

Andre’s ratio: Andre’s rate: miles per hour

* + 1. Answer the same two questions in part (ii) for the other three drivers.

Matteo’s ratio: Matteo’s rate: miles per hour

Janaye’s ratio: Janaye’s rate: miles per hour

Greyson’s ratio: Greyson’s rate: miles per hour

* + 1. For each driver in parts (ii) and (iii), circle the unit rate, and put a box around the rate unit.
	1. A publishing company is looking for new employees to type novels that will soon be published. The publishing company wants to find someone who can type at least words per minute. Dominique discovered she can type at a constant rate of words in minutes. Does Dominique type at a fast enough rate to qualify for the job? Explain why or why not.

*Scaffolding:*

Part (c) could be extended to ask students to figure out how many words Dominique needed to type in the minutes to be able to qualify.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Minutes |  |  |  |  |  |
| Words |  |  |  |  |  |

Dominique does not type at a fast enough rate because she only types words per minute.

Closing (10 minutes)

Describe additional questions:

* What are some examples of rates?
* What are some examples of unit rates?

Lesson Summary

A *rate* is a quantity that describes a ratio relationship between two types of quantities.

For example, miles/hour is a rate that describes a ratio relationship between hours and miles: If an object is traveling at a constant miles/hour, then after hour it has gone miles, after hours it has gone miles, after hours it has gone miles, and so on.

When a rate is written as a measurement, the *unit rate* is the measure (i.e., the numerical part of the measurement). For example, when the rate of speed of an object is written as the measurement miles/hour, the number is the unit rate. The unit of measurement is miles/hour, which is read as “miles per hour.”

Exit Ticket (5 minutes)

Name Date

Lesson 16: From Ratios to Rates

Exit Ticket

Angela enjoys swimming and often swims at a steady pace to burn calories. At this pace, Angela can swim meters in minutes.

* 1. What is Angela’s unit rate?
	2. What is the rate unit?

Exit Ticket Sample Solutions

Angela enjoys swimming and often swims at a steady pace to burn calories. At this pace, Angela can swim meters in minutes.

* 1. What is Angela’s unit rate?
	2. What is the rate unit?

Meters per minute

Problem Set Sample Solutions

The Scott family is trying to save as much money as possible. One way to cut back on the money they spend is by finding deals while grocery shopping; however, the Scott family needs help determining which stores have the better deals.

1. At Grocery Mart, strawberries cost for , and at Baldwin Hills Market strawberries are for .
	1. What is the unit price of strawberries at each grocery store? If necessary, round to the nearest penny.

Grocery Mart: per pound ( rounded to the nearest penny)

Baldwin Hills Market: per pound

* 1. If the Scott family wanted to save money, where should they go to buy strawberries? Why?

Possible Answer: The Scott family should go to Baldwin Hills Market because the strawberries cost less money there than at Grocery Mart.

1. Potatoes are on sale at both Grocery Mart and Baldwin Hills Market. At Grocery Mart, a bag of potatoes cost , and at Baldwin Hills Market a bag of potatoes costs . Which store offers the best deal on potatoes? How do you know? How much better is the deal?

Grocery Mart: per pound

Baldwin Hills Market: per pound

Grocery Mart offers the best deal on potatoes because potatoes cost less per pound at Grocery Mart when compared to Baldwin Hills Market.